REMARKS

Remarks to follow are numbered to correspond with the various points set forth in the office action.

Interview Summary - October 7, 2004

Fulfilling applicant's obligations under MPEP 713.04, applicants hereby records concurrence that Examiner's summary of the October 7, 2004 interview, paper #3, accurately summarizes the substance of that interview. This summary also is accurate in pointing out that agreement was not reached. Applicants disagree with examiner in a number of areas, as discussed below.

Election/Restrictions

1. Please cancel claims 1-65, which were previously withdrawn in response to an earlier restriction.

2. Claim Rejections - 35 USC § 112

3. "Written Description" Requirement

MPEP 2163.02 sets out the standard for determining compliance with the written description requirement. It says, in part:

". . . Under *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991), to satisfy the written description requirement, an applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, *he or she was in possession of the invention, and that the invention, in that context, is whatever is now*

claimed. . . . Whenever the issue arises, the fundamental factual inquiry is whether the specification conveys with reasonable clarity to those skilled in the art that, as of the filing date sought, *applicant was in possession of the invention as now claimed*. See, e.g., *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991). An applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means as *words, structures, figures, diagrams, and formulas* that fully set forth the claimed invention. *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (Fed. Cir. 1997). . . . The subject matter of the claim <u>need not be described literally</u> (i.e., using the same terms or *in haec verba*) in order for the disclosure to satisfy the description requirement. . . ."

Examiner rejects the claims as failing to comply with the written description requirement because of the presence of three limitations in the claims: "freely positioned," "non-destructively" / "substantially all explosive impact is provided from said at least one explosive material," and "at least *some* coolant." Each limitation is examined in turn. The following discussion for each limitation is, of course, limited to claims explicitly containing that limitation.

<u>Freely positioned</u>: Although the explicit, precisely-worded phrase "freely positioned" does not appear in the original January 17, 1997 disclosure from which applicants claim priority, there is ample support for this limitation throughout applicants'

disclosure. Indeed, as outlined in the original disclosure, the entire underlying thrust of what applicants disclosed and were in possession of on January 17, 1997 is that a heat exchange device can be deslagged while it remains hot by a) cooling an explosive situated at the end of a tubular device, b) applying force to part of the tubular device outside the heat exchange device to position the explosive end of the tubular device until it reaches whatever position is desired for deslagging and c) detonating the explosive. This is what applicants possessed and disclosed on January 17, 1997. And, as pointed out above, "[t]he subject matter of the claim *need not be described literally* (i.e., using the same terms or *in haec verba*) in order for the disclosure to satisfy the description requirement."

Let us examine in further detail, the support provided in applicants' original disclosure for applicants' possession of "freely positioned." Reference will be made throughout this reply to where the cited subject matter is disclosed in U.S. Patent 5,769,034, since the written description (other than claims) and the drawings were not amended from the time of filing to the time this patent issued and thus provides a clear point of reference to exactly what was possessed and disclosed by applicants on January 17, 1997.

First, we examine the motivation for applicants' invention, in light of what was known and practiced in the art before January 17, 1997, as disclosed on January 17, 1997.

Prior to on January 17, 1997, the general concept of using explosives for deslagging was well known in the art. Thus, as

pointed out in U.S. 5,769,034, "[t]he use of explosive devices for deslagging is a particularly effective method, as the large shock wave from an explosion, *appropriately positioned* and timed, can easily and quickly separate large quantities of slag from the boiler surfaces" (column 1, lines 21-25). "The geometric configuration of the explosive *placement*, and the timing, are *chosen* to optimize the deslagging process" (column 1, lines 50-51). "[L]oop clusters of detonating cord . . . are again geometrically *positioned*, and detonated with certain timed delays, to optimize effectiveness" (column 1, lines 53-55). "U.S. Pat. No. 5,056,587 similarly discloses *placement* of explosive cord about the tubing panels at *preselected*, appropriately spaced *locations*, and detonation at preselected intervals, once again, to optimize the vibratory pattern of the tubing for slag separation" (column 1, lines 56-60).

Applicants then conclude: "Each of these patents discloses certain geometric configurations for *placement of the explosive*, as well as timed, sequential detonation, so as to enhance the deslagging process. But in all of these disclosures, the essential problem remains. If the boiler were to remain on-line during deslagging, the heat of the boiler would cause the explosive to prematurely detonate before it is properly placed, and this uncontrolled explosion will not be effective, may damage the boiler, and could cause serious injury to personnel. *It would be desirable if a device, system and method could be devised which would allow explosives to safely and controllably be used for deslagging, on-line, without any need to shut down*

the boiler during the deslagging process. By enabling a boiler or similar heat-exchange device to remain on-line for explosives-based deslagging, valuable operations time for fuel-burning facilities could then be recovered."

All of the above makes clear that a motivation clearly set forth in applicants' disclosure was getting the explosives "placed" or "positioned" into "chosen" or "preselected" "locations" where deslagging can be performed, without waiting for the heat exchange device to cool down.

By January 17, 1997, it was thus well understood by applicant and anyone else skilled in the art that explosives were a valuable tool for deslagging heat exchangers. Because explosives were widely used in practice for deslagging, it was also well understood by applicant and anyone else skilled in the art *where* one would desire to position explosives within a heat-exchange device in order to engage in deslagging. What was *not* known in the art on January 17, 1997, was *how* to efficiently and safely introduce explosives into a heat-exchange device and position these explosives to suitably-chosen deslagging locations, without having to shut down the heat exchanger to do so and without requiring extensive preconfiguring of the heat exchanger. We now turn to what applicants did disclose on January 17, 1997 about how to achieve this objective.

Applicants talk about positioning of the explosion throughout the disclosure. For example: "The explosive, while it is being cooled, is *delivered to its desired position* inside the hot boiler without detonation." (column 2, lines 33-35). "Once

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the explosive has been *moved into the proper position* and its temperature maintained at a low level, the explosive is detonated as desired, thereby separating the slag from, and thus cleaning, the boiler" (column 2, lines 55-59).

At column 3, lines 22-29, applicants state that "[t]he cleaning of the fuel burning and/or incineration facility is carried out *in the usual manner* by means of an explosive device **101**, such as but not limited to an explosive stick or other explosive device or configuration, *placed appropriately inside the facility*, and then detonated such that the shock waves from the explosion will cause slag and similar deposits to dislodge from the walls, tubing, etc. of the facility."

Then, after describing some embodiments for cooling the explosive, applicants turn to Figure 3, which is described at column 6, lines 35-64, in the following terms: "Once this flow is established and the explosive is maintained in a cool state, the entire cooling and cleaning delivery assembly **11** *is placed into the on-line facility* ***31*** *through an entry port* ***32*** *such as a manway, handway, portal, or other similar means of entry*, while the coolant supply and explosive positioning system **12** remains outside of said facility. At a location near where assembly **11** meets system **12**, the pipe **106** or tube **122** is rested against the bottom of the entry port **32** at the point designated by **33**. . . . *Applying appropriate force* ***34*** *and using* ***33*** *as the fulcrum, the operator positions the explosive* ***101*** *to the position desired*. . . . Finally, when the operator *has moved the explosive* ***101*** *in the desired position*, the initiator **103** is activated to initiate the

explosion. This explosion creates a shock wave in region **35**, which thereby cleans and deslags that region of the boiler or similar facility, while the boiler/facility is still hot and on-line."

Applicants thus plainly possessed how to deslag heat exchangers with explosives, "in the usual manner," but without having to first cool down the heat exchanger. In using the phrase "in the usual manner," applicants made clear that they envisioned continuing to use explosives for deslagging, and locating the explosives at positions similar to those which would have been chosen in a cooled-down heat exchanger under prior art practice. What applicants disclosed on January 17, 1997, was a novel and nonobvious way to position these explosives to these desired, chosen positions, without having to first cool down the heat exchanger, and without extensive preconfiguring of the heat exchanger.

The above passages also make clear that the cleaning assembly **11** is placed through the heat exchange device through an entry port, that force from outside the heat exchange device is applied to explosive positioning system to position the explosion to the desired position, and that after the desired position has been reached, the explosive is detonated. This demonstrates an example of what the claims refer to as "free positioning."

As noted above: "An applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means as . . . *figures* . . . that fully set forth the claimed invention." Figure 3 itself,

coupled with the foregoing discussion, further establishes that applicants were in possession of the free positioning of the explosion at the time of disclosure. Clearly, Figure 3 discloses positioning the explosive wherever might be desired in the heat exchange device. It is clear that the tubular device with the explosive at the end can, for example, be thrust in and out of entry port **32** along one dimension (the axis running through the center of the tubular device), and then angularly rotated about a fulcrum such as **33**, as indicated by the arrow **34**, through the remaining two dimensions. Thus, a desired positioning within the open space inside the heat exchange device through all three dimensions is achieved, as is clearly illustrated by Figure 3. This further supports free positioning.

Taking all of the foregoing together, it is eminently clear that the original disclosure demonstrates that applicants were fully in possession of "a tubular device *freely positioned* into the hot heat-exchange device" as set forth in claims 66, 92, 118, 128, 129, and 130, at the filing of the initial disclosure on January 17, 1997. As such, this the "written description" rejection pertaining to the term "freely positioned" is overcome.

Non-destructively: Examiner rejects claim 66, based on the use of the phrase "non-destructively such that when said at least one explosive material is detonated, substantially all explosive impact is provided from said at least one explosive material."

Applicant states at column 1, lines 34-38: "Were the boiler to remain on-line during cleaning, the immense heat of the boiler would prematurely detonate any explosive placed into the boiler,

before the explosive has been properly positioned for detonation, rendering the process ineffective and *possibly damaging the boiler.*" Further: "If the boiler were to remain on-line during deslagging, the heat of the boiler would cause the explosive to prematurely detonate before it is properly placed, and this uncontrolled explosion will not be effective, may damage the boiler, and could cause serious injury to personnel" (column 1, lie 65 through column 2, line 2). Certainly, applicants were well aware January 17, 1997 of the importance of safe deslagging, and of not doing anything that would cause damage to the heat exchange device itself.

Examiner argues in his summary of the October 7, 2004 interview that "the term 'non-destructively' is new matter since clearly the slag is cracked, knocked off or otherwise 'destructed.'" It appears that the examiner has misunderstood the reasonable meaning of the claim language. The claim language "non-destructively" relates to not causing destruction to the heat exchanger, by cooling in a way that does not cause destruction at the time of detonation. This claim language does *not* relate to preventing destruction to the slag.

Clearly, applicants state throughout their disclosure that the underlying goal is to remove slag by creating a "shock wave" (column 1, lines 19 and 22; column 3, line 27; column 6, line 62) from an explosion. Further, applicants' disclosure made it eminently clear that such deslagging must be done without destroying the heat exchange device or any of its working components. Thus, it is beyond question that on January 17,

1997, applicants possessed the understanding that the goal of explosives-based deslagging was to destroy slag deposits without destroying the heat exchangers being deslagged. It is inconceivable that a person reading applicants' claim limitation "non-destructively" would understand this to mean that the slag itself ought not be destroyed. As such, it is clear that applicants possessed the claim limitation "non-destructively" on January 17, 1997, understood by all to mean destroying slag without causing destruction to the heat exchanger.

Examiner goes on to say in the interview summary that "detonation of the explosive if it is against or very close to the heat exchange device could damage or destroy the wall," and goes on to cite applicants' own disclosure references to avoiding damage. Indeed, as indicated by the examiner, the original disclosure teaches avoiding damage, and that's what the claim refers to. They are consistent and the original disclosure fully supports the claimed concept. The claim does not require that the operator place the explosive material at any possible location in the heat exchanger whatsoever without causing damage. Rather, the claim, as amended to reply to one of the 112 rejections under point 4 below, requires *cooling the explosive in a way that is not likely to cause destruction of the heat exchanger*.

Consequently, the "written description" rejection pertaining to the use of "non-destructively" is overcome. We now turn to the related phrase "cooling . . . said at least one explosive material . . . such that when said at least one explosive

material is detonated, substantially all explosive impact is provided from said at least one explosive material. . ."

Substantially all explosive impact is provided from said at least one explosive material: MPEP 2163.07(a) states: "By disclosing in a patent application a device that *inherently* performs a function or has a property, operates according to a theory or has an advantage, a patent application necessarily discloses that function, theory or advantage, *even though it says nothing explicit concerning it.* The application may later be amended to recite the function, theory or advantage without introducing prohibited new matter. *In re Reynolds*, 443 F.2d 384, 170 USPQ 94 (CCPA 1971); *In re Smythe*, 480 F. 2d 1376, 178 USPQ 279 (CCPA 1973). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted)."

The language in applicants' claim 66 setting forth "cooling . . . said at least one explosive material . . . such that when said at least one explosive material is detonated, substantially all explosive impact is provided from said at least one explosive material. . ." clearly states an inherent (if not essentially explicit) function, theory and advantage of applicants'

disclosure. In particular, the cooling systems disclosed by applicants inherently provide substantially all the explosive impact, as opposed to, for example, VBB publication 5410708 cited by examiner under 35 U.S.C. 102(b) in point 8 of the office action, in which the explosive is surrounded by a pipe which also is exploded, and which pipe inherently shreds into a shrapnel which may likely destroy a heat exchanger. In the VBB reference, a fair share of the explosive impact is provided not by the explosive material, but by the shredded cooling pipe.

As an example of support for the claim language, applicants' US 5,769,034 disclosure of examples and variations for how to cool the explosive, states: "While many obvious variations may occur to someone of ordinary skill in the relevant arts, the preferred embodiment disclosed herein uses a perforated or semi-permeable *membrane* which envelopes the explosive and the cap or similar device used to detonate the explosive" (column 2, lines 37-41). "This cooling envelope **104** is a semi-permeable *membrane* that allows water to flow out of it at a fairly controlled rate. It can have a series of small perforations punched into it, or can be constructed of any semi-permeable *membrane material* appropriate to its coolant-delivery function as will outlined herein" (column 3, lines 48-63).

"The explosive device **101** with cap **102** is affixed to one end of an explosive connector (broomstick) **112** . . . The length of the broomstick **112** may vary, though for optimum effectiveness, it should maintain the explosive **101** at approximately two or more feet from the end of the pipe **106** that contains the coolant

delivery apertures **109**, which, since it is desirable to reuse the pipe **106** and its components, *will minimize any possible damage to the pipe **106** and said components when the explosive is detonated . . .*" (See column 4, lines 19-41.)

"[D]uring the explosion, the explosive **101**, cap **102**, cap wire **119**, broomstick **112**, and broomstick attachment means **113** are all destroyed by the explosion, *as is the envelope **104**. . . .* [T]he envelope **104**, which is for a single use only, should be fabricated from a material that is inexpensive, yet durable enough to maintain physical integrity while water is being pumped into it under pressure. And of course, this envelope **104** must be semi-permeable (**105**), which can be achieved, for example, by using *any appropriate membrane which in essence acts as a filter. . .*" (See column 6, line 65 through column 7, line 10.)

"On the other hand, all other components, particularly the pipe **106** and all of its components **107, 108, 109, 110, 111,** and **118** . . . are reusable . . . (Again, note that the length of the broomstick **112** determines the distance of the pipe **106** and its said components from the explosion, and that approximately *two feet or more* is a desirable distance to impose between the explosive **101** and any said component of the pipe **106.**)" (See column 7, lines 13 through 21.)

It is clear from the above excerpts from applicant's disclosure that applicants' cooling system involves "cooling . . . said at least one explosive material . . . such that when said at least one explosive material is detonated, substantially all explosive impact is provided from said at least one explosive

material. . . ." This is precisely how the disclosed system operates.

First of all, as would be well understood by the person of ordinary skill in the art reading the original disclosure, the coolant itself, e.g., water, will certainly not provide a significant, if any, explosive impact. Rather, it will inherently atomize into a spray. Secondly, applicants' envelope is repeatedly referred to throughout the disclosure as a "membrane." According to one exemplary definition provided by Webster's dictionary, "membrane" is defined as a "*thin pliable sheet of material*." A "membrane" is by no means in the nature, for example, of the pipe which surrounds the explosive in VBB publication 5410708. Applicants' membrane-type envelope - a thin pliable sheet of material - will provide little if any explosive impact. Third, applicants go out of their way to distance the explosive from any pipes used in applicants' exemplary system (e.g., "two feet or more"), so that the pipe *does not explode*. While the explicitly-stated purpose is to enable the pipe to be re-used, the person of ordinary skill in the art understands that the only things between the explosive and the heat exchanger are the coolant, and a thin pliable sheet of material (membrane). In such a configuration, it becomes inherent that "substantially all explosive impact is provided from said at least one explosive material. . ." as set forth in applicant's claims.

In other words, applicant disclosed a system which necessarily functions to cool the explosive material "such that when said at least one explosive material is detonated,

substantially all explosive impact is provided from said at least one explosive material. . ." The written description requirement is therefore satisfied, both generally, and particularly under MPEP 2163.07(a).

At least some coolant: Claims 125 and 130 specify "delivering at least some coolant proximate said at least one explosive material." Examiner states that this has no support in the original specification. Applicants traverse this rejection.

As disclosed at column 7, lines 54-50, "FIG. 4 further shows a modified envelope **104'**, which is narrower where the coolant first enters from the pipe **106** and wider in the region **402** of the explosive **101**. Additionally, this envelope is impermeable in the region where coolant first enters the pipe, and permeable (**105**) only in the region near the explosive **101**. This modification achieves two results."

"First, since a main object of this invention is to cool the explosive **101** so that it can be introduced into an on-line fuelburning facility, . . . by broadening the envelope **104'** near the explosive **101**, as shown by **402**, *a greater volume of coolant will reside in precisely the area that it is needed to cool the explosive **101**, thus enhancing cooling efficiency.*" (See column 7, line 61 through column 8, line 4.)

"Second, since it desirable for hotter coolant that has been in the envelope for a period of time to leave the system in favor of cooler coolant being newly introduced into the envelope, the impermeability of the entry region and midsection of the envelope **104'** *will enable all newly-introduced coolant to reach the*

*explosive before that coolant is allowed to exit the envelope **104'** from its permeable **(105)** section **402**.* Similarly, the coolant in the permeable region of the envelope will typically have been in the envelope longest, and will therefore be the hottest. Hence, the hotter coolant leaving the system is precisely the coolant that should be leaving, while the cooler coolant cannot exit the system until it has traveled [sic] through the entire system and thus become hotter and therefore ready to leave." (See column 8, lines 5 through 18.)

Applicants thus clearly had in their possession on January 17, 1997, knowledge that there were situations in which some coolant might *not* be delivered "proximate said at least one explosive material," for example, in the embodiment illustrated in Figure 1. Figure 1 is thus one example of an embodiment comprising "delivering *at least some* coolant proximate said at least one explosive material," while Figure 4 is an example of an embodiment delivering substantially all of the coolant "proximate said at least one explosive material." Applicants understood and disclosed circumstances in which a cooling system would not deliver *all* of the coolant to the explosive, but rather would only deliver *some* of the coolant.

Claims 125 and 130 set out that it is not necessary to deliver substantially *all* of the "coolant proximate said at least one explosive material." Rather, these claims specify that all that is required to infringe the claims is "delivering *at least some* coolant proximate said at least one explosive material." This is explicitly disclosed, and it is also fully inherent in,

the original disclosure.

For the reasons discussed above, this understanding was fully in applicants' possession on January 17, 1997, and this rejection is overcome.

4. Requirement to "Particularly Point Out and Distinctly Claim the Invention"

Examiner also rejects the claims, stating that applicant fails "to particularly point out and distinctly claim the subject matter which applicant regards as the invention," under 35 U.S.C. 112, second paragraph. "The primary purpose of this requirement of definiteness of claim language is to ensure that the scope of the claims is clear so the public is informed of the boundaries of what constitutes infringement of the patent" (MPEP 2173).

Examiners "should allow claims which define the patentable subject matter with a reasonable degree of particularity and distinctness. Some latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as the examiner might desire. Examiners are encouraged to suggest claim language to applicants to improve the clarity or precision of the language used, but should not reject claims or insist on their own preferences if other modes of expression selected by applicants satisfy the statutory requirement." See MPEP 2173.02, first paragraph, emphasis on "reasonable" *in original*.

"Definiteness of claim language must be analyzed, not in a vacuum, but in light of: (A) The content of the particular

application disclosure; (B) The teachings of the prior art; and (C) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made," see MPEP 2173.02, second paragraph.

Freely Positioned: We turn first to the claim limitation setting forth "a tubular device freely positioned into the hot heat-exchange device."

Regarding the content of the particular (applicants') disclosure, as discussed earlier in relation to the written description rejection, applicants surveyed the prior art for explosives-based cleaning, and then went on to disclose a cooled explosive at the end of a tubular device which is freely positioned into the heat exchange device to carry out cleaning "*in the usual manner* by means of an explosive device" (column 3, lines 23-24). In particular, the "cleaning delivery assembly **11** is placed into the on-line facility **31** through an entry port **32** such as a manway, handway, portal, or other similar means of entry . . . the operator positions the explosive **101** to the position desired. . . . Finally, when the operator has moved the explosive **101** in the desired position, the initiator **103** is activated to initiate the explosion" (column 6, lines 36-61).

The teachings of the prior art, many of which were surveyed in applicants' disclosure, were clear. A heat exchanger would be cooled down, a person of ordinary skill would enter the heat exchanger and position explosives at locations suitable to dislodge the slag, and thereafter, the explosives would be

detonated. What was missing from the prior art, was a novel and nonobvious way to position these explosives to these usual desired positions, without having to first cool down the heat exchanger, which of course implies, without a person entering the heat exchanger. For this purpose, applicants disclosed a novel and nonobvious device and method employing a cooled explosive at the end of a tubular device.

Thus, on January 17, 1997, a person "possessing the ordinary level of skill in the pertinent art" who had read applicant's disclosure, who was aware of the prior art practice of cooling down and physically entering into a heat exchanger to position explosives, who knew the usual desired positions for positioning these explosives, and who then saw a claim setting forth "a tubular device freely positioned into the hot heat-exchange device" with a cooled explosive at its far end would understand applicants' claim to mean that one uses the tubular device to freely position the cooled explosive to the desired deslagging positions.

Thus, the claims, by specifying a novel and nonobvious way of positioning an explosive to desired deslagging positions without having to cool down and enter the heat exchanger, by providing a cooled explosive at the end of a tubular device, do "define the patentable subject matter with a reasonable degree of particularity and distinctness," and should be allowed.

Examiner's suggestion in the October 7, 2004 interview summary "instead of using the term 'freely positioned,' to recite the actual heat exchange structure itself which would permit the

desired movement" expresses examiner's "own preferences," per MPEP 2173.02. However, as discussed above, the "modes of expression selected by applicants already satisfy the statutory requirement" based on "content of the particular application disclosure," "teachings of the prior art," and "claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made." Thus, these claims should not be rejected.

Examiner's suggestion in the October 7, 2004 interview summary "that if a device could be freely positioned at any desired position in a tube (even one which provided limited radial movement) the device *could still be considered as being freely positioned*" also misses the mark. Applicants understand that examiner is permitted to give the claims their broadest possible *reasonable* interpretation, but in this case, examiner's suggested interpretation is unreasonably broad and beyond the scope of what applicants reasonably seek to claim. In particular, examiner's suggestion that movement which is permitted in one dimension but very significantly constrained ("limited") in the other two dimensions could still be considered as being "freely positioned," is *not* reasonable. If a person were to crawl in one dimension through a linear tunnel with a two-foot diameter, it would be unreasonable to refer to that as "free positioning." The claim does not merely recite positioning, it recites *free* positioning. The free positioning of the claims covers, for example, positioning permitted in three dimensions within the open space inside the heat exchanger. It

does not reasonably cover, the strict one-dimensional movement through a tube or a bore hole which is tightly constrained in the other two dimensions. It would be an oxymoron to interpret "freely positioned" for a device as including positioning that device "at any desired position in a tube (*even one which provided limited radial movement*)."

As a consequence of the foregoing, applicants respectfully request withdrawal of the rejection of the phrase "a tubular device freely positioned into the hot heat-exchange device" for failing "to particularly point out and distinctly claim the subject matter which applicant regards as the invention" under 35 U.S.C. 112, second paragraph.

Notwithstanding the above, applicants have also added some new claims which do respond directly to the views set forth by examiner in the interview summary. New dependent claims 131 through 136, which respectively depend on independent claims 66, 92, 118, 128, 129 and 130, all set forth "using a tubular device freely positioned *through an open space* of said hot heat-exchange device." This accommodates examiner's views in two ways. First, it recites "the actual heat exchange structure itself which would permit the desired movement," namely, the *open space* inside the heat exchange device which is unequivocally illustrated in applicants' Figure 3. It is well established that things such as "holes" and "open spaces" can be used within a claim to establish structure. Second, an open space, *by definition*, would not be a constrained space with "limited radial movement." These new claims are not required to overcome the various 35 U.S.C. 112

rejections, but applicants have nevertheless added them to reply to the specific issues raised by examiner.

Also notwithstanding the above, applicants have added new independent claims 137, 150 and 163 which specify "introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, *using a cleaning delivery assembly proximate a first end of a tubular device, including placing said cleaning delivery assembly into said hot heat-exchange device through an entry port of said hot heat-exchange device and then applying force to part of said tubular device outside of said hot heat-exchange device, to position said cleaning delivery assembly to said desired position.*" These claims explicitly recite the various structures and procedures set forth in column 6, lines 35-64 of US 5,769,034. Further, new independent claims 170, 171 and 172 similarly recite in different form, the various structures and procedures set forth in column 6, lines 35-64 of US 5,769,034. These new claims are also not required to overcome the various 35 U.S.C. 112 rejections, but are nevertheless added to reply to the specific issues raised by examiner.

Non-destructively: Examiner's interview summary statement that "the term 'non-destructively' is new matter since clearly the slag is cracked, knocked off or otherwise 'destructed'" makes even less sense when one examines the requirement to "distinctly claim the subject matter which applicant regards as the invention . . . to ensure that the scope of the claims is clear so the

public is informed of the boundaries of what constitutes infringement of the patent."

What examiner seems to suggest is that a person of ordinary skill would read claim 66 which says "non-destructively," and conclude therefrom that the slag should not be destroyed, despite the eminently clear disclosure to the contrary. And, examiner seems to suggest the use of "non-destructively" claim 66 is *unclear whether it is the slag which needs to be destroyed or the heat exchanger which needs to be destroyed.* This simply makes no sense. *Applicants were not disclosing a method for destroying heat exchangers. Applicants were disclosing a method for removing slag while not destroying the heat exchanger.* There is simply no other possible reasonable interpretation for the term "non-destructively" as used in applicants' claims. This rejection is clearly overcome.

Examiner also states that "it is not clear if the term 'non-destructively' is to relate back to the step of cooling or, to the step of introducing. Applicant has amended claim 66 to make clear that non-destructively relates to the cooling.

Finally, examiner states that "claim 66 is vague, indefinite and incomplete as to how and in what manner, the mere step of cooling (no degree of cooling being recited) and/or the mere step of introducing, results in the 'nondestructive' feature.

This is made clear in the earlier discussion regarding the written description requirement. The manner in which one cools the explosive to avoid destruction of the heat exchanger is to not surround the explosive with any material which might itself

impart a substantial share of the explosion such as to destroy the heat exchanger, and to locate any such material far enough from the explosive so that the heat exchanger is not destroyed or damaged. This is discussed further in the next subsection.

Substantially all explosive impact is provided from said at least one explosive material: Taking note of the requirement for definiteness set forth in MPEP 2173.02, second paragraph, cited above, the pertinent content of applicants' disclosure was reviewed extensively in the earlier "written description" discussion. The fact that a membrane - a "thin pliable sheet of material" - surrounds the explosive in the preferred embodiment of the cooling system, and the fact that harder structures such as pipes are purposely distanced from the explosion so they will not themselves be destroyed, all are clearly disclosed.

The fact that the requirement to destroy only slag and not the heat exchanger itself was self-evident from applicants' January 17, 1997 disclosure makes it clear that the applicants' claim language specifying "cooling . . . said at least one explosive material, said cooling non-destructively such that when said at least one explosive material is detonated, substantially all explosive impact is provided from said at least one explosive material. . ." is quite clear and definite.

The "claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made" would, again, be to not surround the explosive with any material which might itself impart a substantial share of the explosion such as to destroy the heat

exchanger, and to locate any such potentially-destructive material far enough from the explosive so that the heat exchanger is not destroyed or damaged. Certainly, it would be clearly understood, as shown above, that the disclosed method of cooling allows cooling of the explosive and destruction of slag without destroying the heat exchanger. Based on the disclosed embodiment, this includes making sure that substantially all of the explosive impact is provided from the explosive itself rather than from the cooing system itself exploding and damaging the heat exchanger.

As a result of the foregoing, this rejection is also overcome.

Cooling, using a coolant: Claim 66 is amended to change "a" to "said" in lines 13-14, to correct an error in the antecedent basis.

At least some coolant: Claim 130 is amended to correct the error noted by examiner in the antecedent basis in line 8.

Examiner's asserts further that claims 125 and 130 are "vague, indefinite and incomplete as to how and in what manner, only some of the introduced coolant is delivered to the explosive material."

As noted earlier, the content of applicants' disclosure clearly addresses this point in the contrast between the Figure 1 and Figure 4 embodiments. In Figure 1, some of the coolant does not get delivered to the explosive material. Claims 125 and 130 simplify specify that all that is required to infringe the claims is "delivering *at least some* coolant proximate said at least one

explosive material." Thus, someone who delivers coolant proximate at least one explosive material will be infringing on these claims, even if some of the coolant does not arrive to cool the explosive material, so long as some of the coolant does arrive. A person of ordinary skill would interpret this to mean that if some of the coolant leaks out, or for some other reason does not reach the explosive, the claim still covers this configuration so long as some coolant does reach the explosive material. This sets forth a "reasonable degree of particularity and distinctness" and so this rejection is thereby overcome.

5. "Enablement" Requirement

According to MPEP 2164.01: "The standard for determining whether the specification meets the enablement requirement was cast in the Supreme Court decision of *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916) which postured the question: is the experimentation needed to practice the invention undue or unreasonable? That standard is still the one to be applied. *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). Accordingly, even though the statute does not use the term "undue experimentation," it has been interpreted to require that the claimed invention be enabled so that any person skilled in the art can make and use the invention without undue experimentation. *In re Wands*, 858 F.2d at 737, 8 USPQ2d at 1404 (Fed. Cir. 1988). See also *United States v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) ("The test of enablement is whether one reasonably skilled in the art

could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation."). *A patent need not teach, and preferably omits, what is well known in the art. In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986); *cert. denied*, 480 U.S. 947 (1987); and *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1463, 221 USPQ 481, 489 (Fed. Cir. 1984). . . . The fact that experimentation may be complex does not necessarily make it undue, if the art typically engages in such experimentation. *In re Certain Limited-Charge Cell Culture Microcarriers*, 221 USPQ 1165, 1174 (Int'l Trade Comm"n 1983), *aff'd. sub nom., Massachusetts Institute of Technology v. A.B. Fortia*, 774 F.2d 1104, 227 USPQ 428 (Fed. Cir. 1985). See also *In re Wands*, 858 F.2d at 737, 8 USPQ2d at 1404. The test of enablement is not whether any experimentation is necessary, but whether, if experimentation is necessary, it is undue. *In re Angstadt*, 537 F.2d 498, 504, 190 USPQ 214, 219 (CCPA 1976)."

MPEP 2164.01(a) sets out the various factors used to determine whether experimentation is required and whether any such experimentation is "undue." "[A]ny conclusion of nonenablement must be based on the evidence as a whole. 858 F.2d at 737, 740, 8 USPQ2d at 1404, 1407."

In light of the written description support outlined above, in this area of predictable mechanics, no question of enablement exists. Indeed, the examiner's enablement rejections appear to

merely bootstrap on the written description rejections.

Freely Positioned: We turn first to the claim limitation setting forth "a tubular device freely positioned into the hot heat-exchange device."

There is no evidence whatsoever - and it is difficult to envision any evidence which might be presented - that it would require "undue experimentation" for a person of reasonable skill to practice freely positioning applicants' tubular device into the hot heat exchange device, after reviewing applicants' January 17, 1997 disclosure. Examining the various considerations set forth in MPEP 2164.01(a), the state of the prior art on January 17, 1997 was clear: heat exchange devices needed to be cooled down so that a person of ordinary skill could enter the heat exchanger, position the explosives, and then detonate them. Persons of ordinary skill already knew based on cooled-down heat exchanger practice *where* to position the explosives, so applicants' patent application thus "preferably omits" discussing each any every such potential location per MPEP 2164.01.

Applicants disclose a structure and process in which: a tubular device is freely positioned into the heat exchange device while an explosive, which is cooled, is delivered to the sites (previously known in the "cooled down" art, thus preferably omitted) where detonating the explosive will dislodge slag deposits. Once the original disclosure is read, freely positioning a tubular device with a cooled explosive at the end of it into a heat exchange device and then detonating the explosive once the desired deslagging position has been reached

can be readily carried out. No "undue experimentation" is required. A person of ordinary skill - that is, someone who had been deslagging heat exchangers with explosives the old-fashioned way (cooling down the heat exchanger and then placing explosives manually) before January 17, 1997 - would have found it very simple to review applicants' disclosure, and thereafter, deslag a heat exchanger using applicants' device. Applicants provided an example of directions about how to do this in column 6, lines 35-65 of U.S. 5,769,034. No undue experimentation is necessary.

In sum, there is absolutely no evidence that undue experimentation is required following applicants' disclosure for free positioning. Nor is undue experimentation in fact required. Therefore, the rejection is overcome.

Non-destructively: Regarding enablement, the question is whether "undue experimentation" would have been required, following applicants' January 17, 1997 disclosure, to deslag a heat exchange device "non-destructively."

It is again pointed out that "[a] patent need not teach, and preferably omits, what is well known in the art. *In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986), *cert. denied*, 480 U.S. 947 (1987); and *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1463, 221 USPQ 481, 489 (Fed. Cir. 1984)."

Based on what was well-known in the art on January 17, 1997, a person of ordinary skill in the art would readily understand

that applicants' disclosed process inherently achieves deslagging without damaging the heat exchanger. People practicing in the art knew where to position explosives for maximum desired effect, while avoiding destruction of the heat exchanger. According the case law set forth above, it was totally unnecessary, and not preferred, for applicants' to have turned their patent disclosure into a "deslagging 101" tutorial on where to position explosives for safe deslagging.

What applicants did disclose, and enabled through the original disclosure, was how to perform deslagging safely *without waiting for the heat exchanger to cool down*. In particular, applicants disclosed how to maintain the explosives in a cooled-down state so they would not be prematurely detonated while in a position which people of ordinary skill knew was *not* safe for an explosion. And applicants disclosed how to defer the explosion until the explosive could be freely positioned to where person of ordinary skill knew that it *was* safe for an explosion.

As a consequence of the foregoing, the enablement rejection is overcome in relation to the limitation "non-destructively."

Substantially all explosive impact is provided from said at least one explosive material: Based on the earlier discussion regarding the written description and indefiniteness rejections, it is clear that no undue experimentation is required for "cooling . . . said at least one explosive material, said cooling non-destructively such that when said at least one explosive material is detonated, substantially all explosive impact is provided from said at least one explosive material. . ." As

stated before, one simply needs to not surround the explosive with any material which might itself impart a substantial share of the explosion such as to destroy the heat exchanger, and to locate any such material far enough from the explosive so that there is similarly no destructive impact to the heat exchanger, as disclosed by applicants. The examples provided by applicants included employing a "membrane," and distancing the explosive from any "pipes" which may be part of the coolant delivery system. This rejection is overcome.

At least some coolant: Finally, there would clearly be no "undue experimentation" required for "delivering at least some coolant proximate said at least one explosive material." It does not take any unusual skill or experimentation to establish a system in which some of the coolant does not reach the explosive. Thus, this rejection is traversed.

Joint Inventors

6. Applicants are advised of this obligation under 37 C.F.R. 1.56. All claims are and have been commonly owned at all times since January 17, 1997.

Claim Rejections - 35 USC § 102 and 103

7,8. VBB publication number 5410708 does not disclose or suggest "introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, using a tubular device freely positioned into the hot

heat-exchange device" as set recited in applicants' claims 66, 92, and 118. Nor does it disclose or suggest the related recitations of claims 128, 129, 130. Nor does it disclose or suggest "using a tubular device freely positioned into the hot heat-exchange device comprising using a tubular device freely positioned through an open space of said hot heat-exchange device" as recited in new claims 131 through 136. Nor does it disclose or suggest "introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, using a cleaning delivery assembly proximate a first end of a tubular device, including placing said cleaning delivery assembly into said hot heat-exchange device through an entry port of said hot heat-exchange device and then applying force to part of said tubular device outside of said hot heat-exchange device, to position said cleaning delivery assembly to said desired position" as recited in claims 137. Nor does it disclose or suggest the related recitations of claims 150, 163, 170, 171, and 172.

The VBB reference is very clear throughout about the need to preconfigure a "loading chamber" ("laderaum" in the German document) into which the explosive is then placed. The VBB reference refers to this loading chamber repeatedly, well over a dozen times. Particular exertions are employed to produce this loading chamber, and are also examined at great length in VBB. For example, the chart entitled "blasting sequence" ("Ablauf der Sprengarbeiten" on page 350 of the German document) illustrates

in detail, suitable loading chamber depths in meters. Also, Figure 4.15.2 illustrates "[p]roducing the loading chamber by means of an oxygen lance." There is a great deal of further discussion of various ways to produce this loading chamber, e.g.: "Production of the loading chambers can be adapted to the particular conditions of the object to be blasted and the material. For example, *hand-held drills* and *drill carriages with surface drills* are used in materials such as masonry, concrete, fire-resistant materials, deposits in industrial furnaces and various slags. For other slags - especially those with high metal content - and for furnace sow, the *oxygen lance* is used. Recently there has been an ever increasing tendency wherever possible to *build in the loading chambers already during new construction* or general repairing of the assemblies." (See, in original, first full paragraph on page 349.) All of this points toward a significant effort to *preconfigure* the furnace, and *teaches away* from any approach - such as disclosed by applicants - which allows *flexible positioning without preconfiguration*.

Thus, as was stated, for example, in a July 16, 2003 decision by a three-member Technical Board of Appeal 3.2.3 in related European case 00203711.7 (now patent EP 1 067 349): in the VBB reference, "the application of the explosive charge for deslagging is limited . . . to deslagging of a furnace by introducing the explosive charge into a predetermined and preconfigured loading chamber prepared in the furnace." (For reference purposes, a copy of this decision is included with this reply.) This is a factual statement describing the disclosure of

the VBB reference, by this appeal panel.

Thus, according to this same three-judge panel, applicants' invention, in relation to VBB, "adds a new aspect in that it allows for a flexible deslagging of *any parts of a heat exchange device* . . . rather than being restricted to a predetermined position . . ." All of applicants' claims herein recite a flexibility in positioning which is simply not disclosed or suggested by the VBB reference. Indeed, because of all the emphasis given to properly preparing the loading chamber, VBB actually *teaches away from* applicants' invention in which positioning of the explosive is exceedingly more flexible. In addition, as discussed at length in this reply, this flexibility in positioning as set forth in applicants' claims meets all the requirements of 35 U.S.C. 112. Consequently, all of applicants' claims are allowable over the VBB reference.

The recitation in claim 66, of "cooling, using a coolant, said at least one explosive material when introducing said at least one explosive material into the hot heat exchange device, said cooling non-destructively such that when said at least one explosive material is detonated, substantially all explosive impact is provided from said at least one explosive material, using said coolant cooling said at least one explosive material," adds further patentable distinctness over VBB.

As noted in the earlier discussion under point 2, in VBB, the explosive is surrounded by a "double jacket cooling *pipe*" ("Doppelmantelhühlrohr", see page 347), illustrated in Figure 4.15.1, which also is exploded, and which pipe inherently shreds

into a shrapnel that will most likely destroy a heat exchanger. If there is any doubt about this, it is instructive to look at Figure 4.15.5, "after the explosion," which when contrasted to Figure 4.15.4, illustrates flames and shredding all around the vicinity of the explosion. As plainly understood by the person of ordinary skill in the art, in the VBB reference, a significant share of the explosive impact is provided not by the explosive material itself, but by the shredded double jacket cooling pipe.

As such, claim 66 contains further patentable distinctness over VBB.

Double Patenting

9,10. Applicant has filed herewith, a terminal disclaimer to obviate the double patenting rejection over U.S. Patents 6,604,468; 6,431,073; 6,321,690; and 5,769,034. The filing of this terminal disclaimer is without prejudice regarding the issues raised in the double patenting rejection.

Missing reference / Upcoming Information Disclosure

11. Applicants' counsel faxed a copy of GB 823353 to examiner on September 30, 2004.

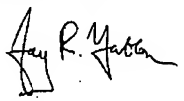
Applicants also wish to advise examiner that in the past several weeks, some new references not presently on record were provided to applicants in connection with a counterpart application in Europe. Applicants are still analyzing these new references and plan to submit them in an information disclosure by the middle of January 2005, within three months of when they

were first received by applicants and applicants' agents. Applicants are calling this to examiner's attention as a courtesy, to help examiner avoid any reiterative work on this case.

Conclusion

12. As a consequence of the foregoing, applicants respectfully request allowance of all claims and looks forward to receiving a notice of allowance in the near future, or to a phone conference to resolve any outstanding issues which may remain following this reply.

Respectfully submitted,



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